

ASYNCHRONOUS DISPLAY TERMINAL MARKET

VOLUME I : MARKET PERSPECTIVES

INPUT

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ASYNCHRONOUS DISPLAY TERMINAL MARKET

VOLUME I:

ASYNCHRONOUS DISPLAY TERMINAL MARKET PERSPECTIVES

Prepared For:

INTERNATIONAL BUSINESS MACHINES CORPORATION
SYSTEMS COMMUNICATION DIVISION

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ASYNCHRONOUS DISPLAY TERMINAL MARKET

(Volume I and Volume 2)

The objective of this study was to determine the size and growth of the ASCII asynchronous display terminal market. Leading vendors and distributing intermediaries were interviewed to determine market size and trends.

The report has been published in two volumes: Asynchronous Display Terminal Market Perspectives, and Intermediaries' Requirements for Asynchronous Display Terminals.

The report determined that price is the major issue in this market as vendors continue to standardize on features and terminal intelligence capabilities.

ASYNCHRONOUS DISPLAY TERMINAL MARKET
VOLUME I:
ASYNCHRONOUS DISPLAY TERMINAL MARKET PERSPECTIVES

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I INTRODUCTION

I INTRODUCTION

A. PURPOSE AND SCOPE

- This report was prepared by INPUT as a custom study for IBM Systems Communication Division, Kingston, New York.
- It is an update and in-depth extension of previous studies done by INPUT for IBM in March 1978 and March 1979, examining key areas of the CRT terminal market.
- The objective of this study is to determine the size and growth of the ASCII asynchronous display terminal market by interviewing (a) the leading vendors of this type of equipment and aggregating their nonproprietary shipment data for 1980 and 1981, and (b) buying organizations that reside in the distribution chain between the terminal manufacturer and the ultimate end user.
- The scope of this study is limited to asynchronous display terminals using the ASCII character set.
- This report is published in two volumes.
 - Volume I, Asynchronous Display Terminal Market Perspectives, presents INPUT's analysis of the results of interviews with display terminal manufacturers.

- Volume II, Intermediaries' Requirements for Asynchronous Display Terminals, describes intermediaries' perspectives of the marketplace.
- In Volume I, four major perspectives are developed:
 - Industry structure - including the distribution framework, the pricing levels within the distribution channels, and terminal function differentiations.
 - Vendor perspectives - including major strategies, the sources of supply, and the industry coverage by major vendor.
 - Outlook - including product trends, pricing trends, the timing of major changes in product or pricing, and the impact of other products.
 - Industry statistics - including a nine-year chart of shipments (1978-1986) by functional differentiation, as well as current percentages along the various distribution channels.
- Volume II discusses the product requirements of systems integrators and distributors with regard to asynchronous display terminals.
 - In the asynchronous display terminal marketplace, at least six intermediary buying organizations exist and, for purposes of this study, IBM limited it to two, Systems Integrator (SI) and Value-Added Distributor (VAD), which are defined as:
 - Systems Integrator (SI): A company that purchases display terminals for inclusion in its product or system. This company may or may not manufacture some of its own hardware but most likely adds its own software thereby orienting the system to a particular industry. The system is directed toward the general data processing marketplace.

- Value-Added Distributor (VAD): A company that buys display terminals in bulk quantities from the terminal manufacturer and resells them to the ultimate end user. Value is added by the provision of maintenance service, by the availability of leasing plans or other financing services, and by making the terminals available from stock, providing immediate availability, if required.
- This study analyzes the intermediaries':
 - Applications.
 - Hardware used and typical configurations.
 - End users served.
 - Industry.
 - Geographic constraints.
 - Company size - sales/employees/etc.
 - Purchasing process.
 - Evaluation procedures.
 - Price and brand sensitivity.
 - Service requirements.
 - Product requirements.
 - Functions.

- . Size.
- . Human factors.
- . Reliability.
- . Response time.
- View of the future.
 - . Expansion to new areas.
 - . Outlook for asynchronous displays.
 - . Competition.
 - . New product developments and timing.

B. RESEARCH AND METHODOLOGY

- This study began with on-site planning meetings between IBM Systems Communication Division staff and INPUT staff in Harrison, New York; Saddle Brook, New Jersey; and Kingston, New York.
- Three questionnaires were developed by INPUT and approved by IBM Systems Communication Division to be used as the basis for interviewing the major asynchronous display terminal vendors, systems integrators, and value-added distributors.
- A total of 43 interviews were conducted, as follows:

. Display manufacturers	12
. Systems integrators	20
. Value-added distributors	<u>11</u>
	43

- The names of the companies interviewed and the titles of the interviewees are listed in Appendix A which appears in Volume I.
- Results of these primary interviews were verified by checking logical consistency of reported figures, comparing various published data, and by supplementary interviews with industry knowledgeable sources.
- Results have been aggregated and shuffled in such a way as to preserve anonymity and confidentiality of sources. In particular, it should be noted that respondents referred to as A,B,C, etc., are shuffled from one exhibit to the next.
- All conclusions should be construed to be the best opinion of INPUT, based on the cumulative effect of the data and analysis described above.
- Chapter III of Volume I and Chapters III and IV of Volume II contain the substance of the oral presentation of findings delivered to IBM staff at Kingston on December 11, 1981, and constitute the major portion of the final report of this study.

II EXECUTIVE SUMMARY

II EXECUTIVE SUMMARY

A. FINDINGS

- Shipments of asynchronous display terminals are likely to increase 23% in 1981 to 475,000 units, with independent vendors accounting for 320,000, or 67%, of the total.
- INPUT forecasts a 23% shipment gain in 1982 to 585,000 units. In 1982, independent vendors are likely to increase their market share slightly to 68%.
- The shift in the shipment mix to more features and more intelligence continues, as vendors turn increasingly to 16-bit microprocessors to add more functions.
 - Vendors see limited opportunities for maximizing price competitiveness at the lower end of the product line. Power supply technology, offshore manufacturing, and cheaper casings and enclosures are viewed as possibilities to be explored for overall cost reduction.
 - End users increasingly require more functions, and user price sensitivity appears to be inversely proportional to the degree of functionality incorporated into the product.

- Independent vendors of asynchronous display terminals generally attempt to market their products through intermediaries who are able and willing to commit to high-volume orders on an annual basis.
 - Discount schedules are generally structured to discourage low-volume orders, thereby discouraging end-user orders in favor of orders from intermediaries.
 - Some discount schedules are structured to maximize the profit potential for intermediaries.
- Value-added distributors and (to a lesser extent) systems integrators apparently are becoming more important over time as distribution channels for asynchronous display terminals. Their growing acceptance by end users as direct replacements for the manufacturer's sales and service force is being enhanced by increased product reliability and simplicity of maintenance as typified by carry-in or mail-in depot maintenance and the concept of "throw-away" components such as keyboards.
 - Intermediaries have the potential to become as important in the distribution framework for asynchronous display terminals as independent agents have become in the insurance business.

B. LONGER TERM OUTLOOK

- Independent vendors are likely to increase their share of asynchronous display terminal shipments in the 1981-1986 period, at the expense of systems vendors, because they are less constrained by arbitrary systems marketing requirements and are therefore more responsive to market requirements.

- INPUT forecasts that, by 1986, independent vendor shipments will amount to 855,000 units, representing 78% of total shipments of 1.09 million units.
- Over the next five years, vendors will be striving to provide more functions, at lower cost per function, in response to users' needs.
- Brand sensitivity will continue to exist, to the extent that intermediaries and end users will purchase from vendors whom they perceive to be willing to make a long-term commitment to the market.
- Price sensitivity appears likely to remain high at the low end of the product feature scale and to diminish as functions and flexibility increase.
- Entry-level pricing must therefore reflect acceptance of this reality.
- Vendors and intermediaries agree that continued proliferation of options and features must stabilize into sets of common packages, to keep model inventories manageable.
- Vendors likely will respond to a market requirement for an optional, user selectable display size equivalent to a standard line printer page (132 characters by 66 lines). Users want the option of directing report pages to a line printer or to a terminal without the need for maintaining two sets of output formatting programs.
- Additionally, a 66-line display is viewed as important in word processing applications.
- High-resolution graphics and color graphics, coupled with a hard-copy option, will become a standard feature of asynchronous display terminals over the next five years, as vendors seek to remain competitive and meet market demand.

- INPUT believes that color by itself will not be as advantageous as the combination of color and graphics.
- The use of color to highlight alphanumeric fields appears to offer only limited incremental value over alternative methods such as reverse video and blinking.
- The benefits of color are most readily apparent in graphic displays of multidimensional data matrices, such as comparative percentage distribution of revenues and profits by product and geographic source over several time periods, presented in bar chart form.
- Implicit in meeting the requirement for high-resolution color graphics is the need for supporting the high bandwidth necessary for both color and graphics.
- Ergonomic considerations will increase in importance in the area of terminal design, especially for vendors planning to market their products in Europe.
- Swedish labor unions have already succeeded in causing legislative standards to be enacted with respect to display terminal characteristics.
- In the United States, the National Institute for Occupational Safety and Health (NIOSH) has focused on the suspicion that prolonged CRT use might cause persons under the age of 65 to develop cataracts.
- Intermediaries point out that end-user discomfort with the system interface tends to alienate end users toward the system.
- The stringency of reliability and maintainability expectations will require vendor support for direct replacement of malfunctioning components.

III INDUSTRY PERSPECTIVE

III INDUSTRY PERSPECTIVE

A. TERMINAL FUNCTION DIFFERENTIATIONS

- This study was limited to asynchronous display terminals which use the ASCII character set.
- There are four basic types of asynchronous display terminals:
 - Level 1, which the industry refers to as a dumb terminal, has no special features other than a numeric keypad on a keyboard which may be detachable.
 - Level 2, referred to as a smart terminal, has full editing, formatting, paging, and other features, but is not programmable.
 - Level 3, which is an intelligent terminal, has all the features of the Level 2 terminal and is programmable by the vendor.
 - Level 4, an intelligent terminal, has all the features of the Level 2 smart terminal and is programmable by the user.
- In its research, INPUT found that neither vendors nor intermediaries made any significant distinction between Level 3 and 4 terminals.

- Therefore, forecasts and shipment data are presented in a form which combines Level 3 and Level 4 terminals.
- This combination of the two levels of intelligent terminals was coordinated with IBM representatives at the beginning of the study.
- Terminals, by function, vary widely in price based upon information gathered by INPUT, as illustrated in Exhibit III-1.
 - Level 1 terminals vary from a low end price of \$500 to \$7,000 depending upon the manufacturer, the installation configuration, and the intended user.
 - Higher priced terminals are usually built for a rugged or "hostile" environment and have extra materials and protective components.
 - When configured to operate only under the control of intelligent cluster controllers, Level 1 terminals may have higher prices than comparable devices marketed simply as "glass Teletypes."
 - Level 2 terminals vary in price from \$700 to \$11,000 for the same basic reasons.
 - Level 3 and Level 4 terminals vary much more widely in price, due to the number and the sophistication of the various features provided, which are implemented largely through programming.
 - Due to the variety of these features, there is no typical or average price, as indicated in Exhibit III-1.
- Pricing, as discussed later in this section, reflects a significant discount structure which characterizes this industry.

EXHIBIT III-1

VOLUME AND PRICE COMPARISON OF ASYNCHRONOUS DISPLAY TERMINALS

FUNCTIONAL DIFFERENTIATION	1980 SHIPMENTS (Number Of Units)	PRICE RANGE		TYPICAL PRICE	AVERAGE PRICE	
		LOW	HIGH		SINGLE UNIT	DISCOUNTED
Level 1	96,250	\$ 500	\$ 7,000	\$1,000 - 2,000	\$2,070	\$1,240
Level 2	173,250	700	11,000	2,500	3,400	2,200
Level 3 - 4	115,500	2,000	12,000 +	n.m.	n.m.	n.m.
TOTAL	385,000	—	—	—	—	—

n.m. = NOT MEANINGFUL

- Discounts averaging 25% to 40% are common depending upon volumes and the vendor's perceived competition.
- Features, finally, determine the differentiation between asynchronous display terminals.
 - These features refer specifically to editing capabilities.
 - Level 1 terminals are basically devoid of editing features.
 - Level 2 terminals provide editing features in the hardware logic circuits.
 - Level 3 and Level 4 terminals provide editing and other features which are implemented largely through software.
- Terminal function differentiation, therefore, is a matter of programmability, price, and editing capabilities.

B. DISTRIBUTION FRAMEWORK

- Over 120 manufacturers offer in excess of 300 asynchronous display terminal models within the framework of the four levels of terminals.
- INPUT's estimate of total unit shipments for 1980, as shown in Exhibit III-1, is 385,000 units.
 - By INPUT's estimate, respondents to this survey accounted for 196,800 of the total of 385,000 unit shipments for 1980, or 51% of the total.
 - This is considered to be a valid sample.

- Shipments along distribution channels were estimated to be 250,250 to OEMs or intermediaries and 134,750 to end users.
 - Respondents accounted for the following percentages by distribution channel:
 - To OEMs - 136,200 units (69% of the total).
 - To end users - 60,600 units (31% of the total).
 - Respondents, therefore, ship 69% of their products directly to intermediaries and only 31% to end users.
- Based upon its research, INPUT concludes that vendors are successful in booking relatively large volume orders with intermediaries and, for Levels 1 and 2 particularly, the use of intermediaries is viewed as an efficient distribution channel.
 - This will be discussed in greater detail in a later section.
- INPUT estimates that 65% of the total 1980 shipments went to intermediaries, while 35% were shipped directly to the end user with the bulk of the latter constituting a captive market; i.e., they were part of a manufacturer's total system.
 - These estimates are consistent with vendor responses, as presented in Exhibit III-2.
- INPUT's estimates, therefore, are corroborated by the independent vendors interviewed for this study, with respect to total shipments and the breakdown of intermediary-versus-end-user shipments.
- The estimated shipments of asynchronous display terminals which in 1980 amounted to 385,000 units are broken down by type of terminal as follows:

EXHIBIT III-2

DISTRIBUTION FRAMEWORK
VENDOR OPINIONS OF
1980 ASYNCHRONOUS DISPLAY TERMINAL SHIPMENTS
(\$ thousands)

VENDOR	ESTIMATED 1980 TOTAL SHIPMENTS (Number Of Units)	ESTIMATED SALES		ESTIMATED DISTRIBUTION BY TYPE (Number Of Units)		
		OEM	END USER	LEVEL 1	LEVEL 2	LEVELS 3 AND 4
A	440	\$264	\$176	150	190	100
B	410	246	164	150	170	90
C	400	320	80	*	*	*
D	400	320	80	150	160	90
E	400	280	120	200	160	40
F	400	240	160	150	160	90
G	400	240	160	150	160	90
H	355	213	142	130	140	85
I	300-350	180- 210	120-140	110	120	70
J	300	180- 195	105-120	110	120	70
K	**	**	**	*	*	*
Average	381-386	\$248- 253	\$131-134	144	153	89
Percent	100%	65%	35%	38%	40%	23%

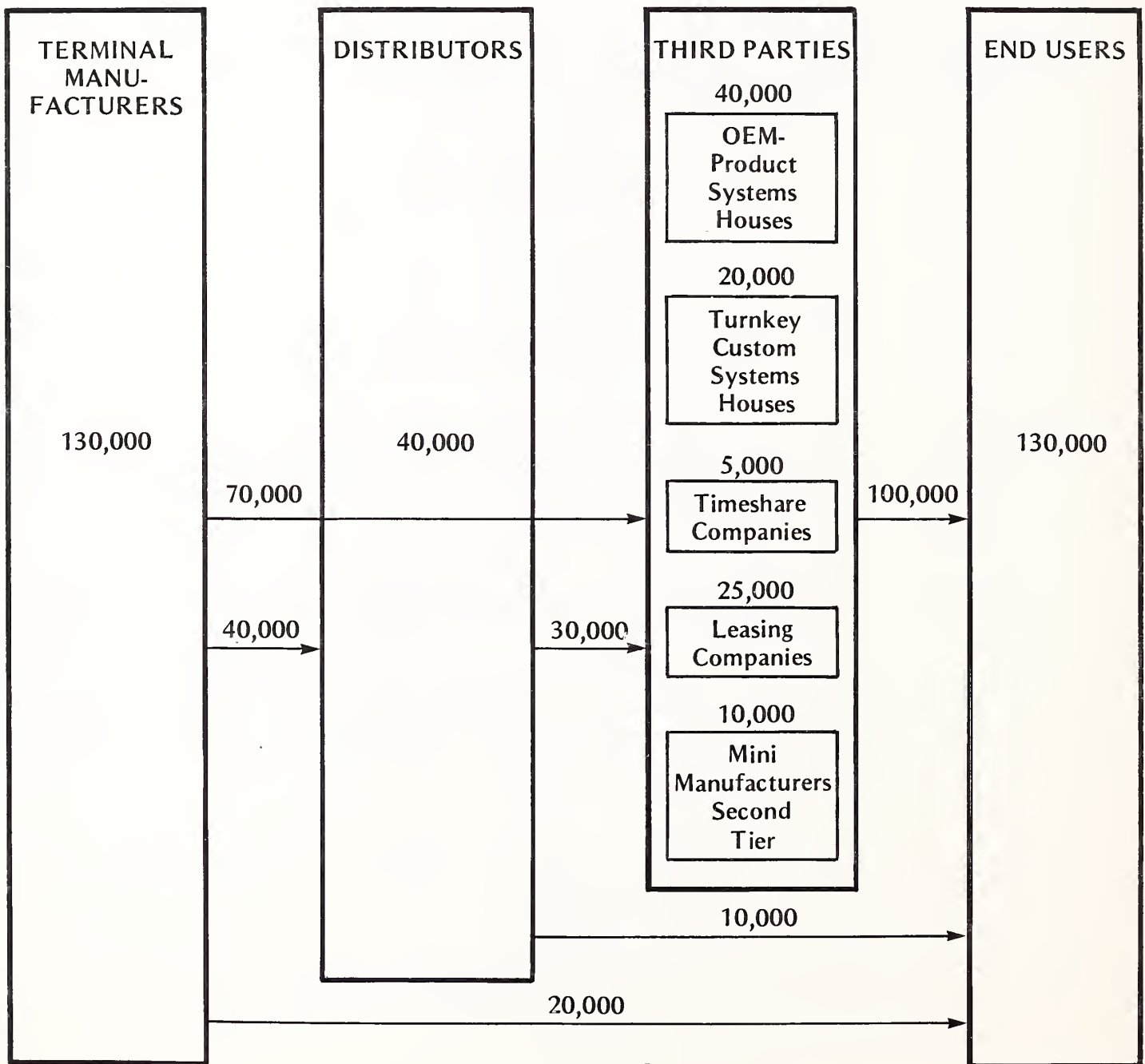
* NOT SURE, BUT SEES A GROWING SHIFT TO PROGRAMMABLE TERMINALS

** NO ESTIMATES

- The results of INPUT's independent research for IBM show the distribution to be as follows:
 - Level 1 terminals - 25%.
 - Level 2 terminals - 45%.
 - Level 3 and 4 terminals - 30%.
- Vendors contacted for this study estimated a slightly different percentage breakdown:
 - Level 1 terminals - 38%.
 - Level 2 terminals - 40%.
 - Level 3 and 4 terminals - 23%.
- The difference is attributable to the respondents' perspectives of the total shipment mix as influenced by each respondent's product mix.
- One vendor declined to estimate 1980 shipments at all, citing his opinion that INPUT could infer his confidential data from the response.
- Average data for total shipments and for percentage distributions of shipments to OEMs and end users, as provided by the vendors, are fairly closely aligned with INPUT's independently developed estimates.
- The structure of distribution channels in 1977 was defined for IBM in an earlier study, and is illustrated in Exhibit III-3.
- Manufacturers in the earlier study reported total shipments of 130,000 units distributed as follows:

EXHIBIT III-3

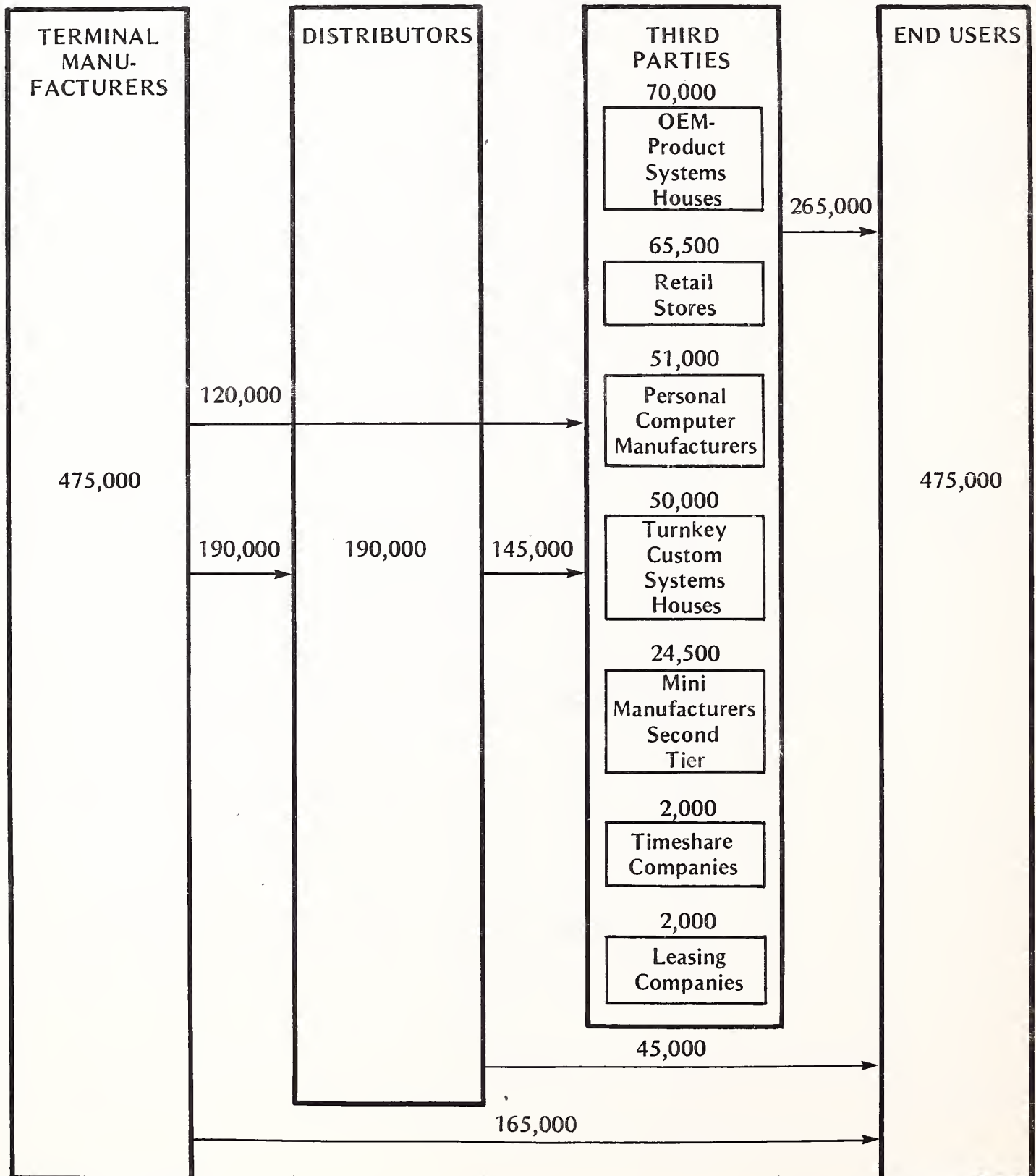
ASCII ASYNCHRONOUS DISPLAY DISTRIBUTION CHANNELS: TERMINALS SHIPPED IN 1977



- To distributors - 40,000 units.
 - To third parties - 70,000 units.
 - To end users - 20,000 units.
- In the second volume of this study INPUT analyzes the distributor and third-party or intermediary markets for IBM.
 - The structure of the distribution channels has changed since 1977 due to the explosive growth in the past four years of the following distributors of asynchronous display terminals on their way to the ultimate end users:
 - Personal computer manufacturers.
 - Small business system manufacturers.
 - Computer retail stores.
 - Exhibit III-3 shows the major distribution channels as they existed in 1977.
 - Exhibit III-4 depicts INPUT's estimate of the number of asynchronous display terminals shipped along the altered distribution framework of 1981.
 - Vendors of timesharing services and third-party leasing companies are even less of a factor than they were four years earlier.
 - With the exception of Tymshare, which still markets display terminals, timesharing vendors generally refer a customer to one or more distributors who operate in the customer's geographic area.
 - The third-party leasing business has shrunk considerably since the demise of Itel and OPM.

EXHIBIT III-4

ASCII ASYNCHRONOUS DISPLAY DISTRIBUTION CHANNELS:
TERMINALS SHIPPED IN 1981



- INPUT's estimate of 51,000 units going through personal computer manufacturers represents roughly 5% of the 1,025,000 personal computers estimated to have been placed in 1981. Keyboards are generally integral with the processor in a personal computer, and usually only a display monitor is added. This estimate does not include display monitors only.

C. PRICING LEVELS AND DISCOUNT CHARACTERISTICS

- Pricing levels were discussed previously and reflect manufacturers' costs based upon the number of features and the degree of sophistication.
 - INPUT views pricing, including discount schedules, as a major factor in the competitive strategy of vendors of asynchronous display terminals.
- Shipment or order lot size is also a competitive strategy as reported by vendors and illustrated in Exhibit III-5.
 - In this exhibit, vendors reported "Shipment and Discount Characteristics" including order size, distribution of shipments, and discount schedules.
- Vendors employ order lot size and discounts as strategic tools to favor one distribution channel over another.
 - One clear strategy is to minimize small shipments to end users by concentrating on volume distributors.
 - Discounts usually increase proportionately as the order size increases.

EXHIBIT III-5

SHIPMENT AND DISCOUNT CHARACTERISTICS

VENDOR	SHIPMENT CHARACTERISTICS BY ORDER SIZE	SHIPMENT DISTRIBUTION PERCENTAGES	DISCOUNT SCHEDULES
A	N/C	1980: 60% Systems Integrators 20 Distributors 20 End Users 1981: N/C	N/C
B	1-25 Units: End Users Over 500 Units: Systems Integrators and Distributors	1980: 50% Systems Integrators 40 Distributors 10 End Users 1981: N/C	N/C
C	N/C	1980: 80% Systems Integrators and Distributors 1981: Same	N/C
D	1-50 Units: End Users Over 500 Units: Systems Integrators and Distributors	1980: N/C 1981: 30% Systems Integrators 40 Distributors 30 End Users	Over 500 Units: 25% 500 or Less: 0
E	Average order is 50-75 Units	1980: 30% Dealers 20 Systems Integrators 30 Distributors 20 End Users 1981: Same	Discounts begin at 300 units
F	N/C	1980: 66% Dealers 20 Systems Integrators 13 Distributors 1 End Users 1981: Same	N/C

N/C = NO COMMENT

Continued

EXHIBIT III-5 (Cont.)

SHIPMENT AND DISCOUNT CHARACTERISTICS

VENDOR	SHIPMENT CHARACTERISTICS BY ORDER SIZE	SHIPMENT DISTRIBUTION PERCENTAGES	DISCOUNT SCHEDULES
G	<p>1-50 Units: Systems Integrators and Distributors</p> <p>51 or More Units: Systems Integrators, Distributors, or End Users</p>	<p>1980: 15% Systems Integrators 45 Distributors 40 End Users</p> <p>1981: Same</p>	30-40%
H	N/C	<p>1980: 15% Systems Integrators 15 Distributors 70 End Users</p> <p>1981: 5% Systems Integrators 5 Distributors 90 End Users</p>	<p>1-50 Units: 10-20%</p> <p>51-100 Units: 20%</p> <p>Over 100 Units: 75%</p>
I	Try for minimum order of 250 units annually	<p>1980: N/C</p> <p>1981: 20% Systems Integrators 80 Distributors</p>	N/C
J	Try for minimum order of 250 units annually	80%+ to OEMs	<p>50 or Less: 0</p> <p>51-100 Units: 30%</p> <p>Over 100 Units: Negotiable</p>
K	<p>200+ Units: Systems Integrators</p> <p>501+ Units: Distributors</p> <p>350+ Units: End Users</p>	<p>1980: N/C</p> <p>1981: 60-70% Distributors</p>	<p>Under 100 Units: 0</p> <p>101-500 Units: 25-30%</p> <p>Over 500 Units: 40%</p>

N/C = NO COMMENT

- . Disproportionate increases in the discount rate (to as much as 75%) are offered by a few vendors, which strongly suggests to INPUT that the vendors are actively discouraging small orders.
- INPUT concludes that a favored distribution channel for vendors is the distributor.
 - This does not mean that the vendor will refuse sales at the lower lot sizes.
- A further observation by INPUT is that discount schedules are negotiable in this industry.
 - Responses marked "N/C" (for "no comment") were frequently accompanied by the observation that discounts are "open" or "subject to negotiation."
 - Some N/C responses indicated the respondent's unwillingness to disclose competitive information which he considered proprietary and critical to his marketing strategy.
- Vendors do not plan any significant future changes from their existing channels of distribution.
 - One exception, seen in Exhibit III-5, is planning to increase his marketing to end users who purchase asynchronous display terminals in large quantities.
 - INPUT does not see this as an industry trend.
- Vendors consider the level of terminal sophistication to be an important additional competitive strategy.

IV VENDOR PERSPECTIVES

IV VENDOR PERSPECTIVES

A. MAJOR STRATEGIES

- Vendors are developing their strategies for asynchronous display terminals in accordance with their views of what will be required to remain competitive over the next five years.
- Major product strategies are based on the following expectations:
 - Future demand for Level 1 terminals is limited and declining, and therefore no new Level 1 terminal product introductions are anticipated or planned.
 - Price per function and feature will continue to decline, which shifts the emphasis to development and enhancement of Level 3 and Level 4 terminals.
 - Intelligence and programmability will become mandatory, both in response to market demand and as vehicles for implementing new functions and features.
 - The 16-bit microprocessor is responsible for a major change in the market for asynchronous display terminals.

- The market will continue to be increasingly receptive to standardization of specific feature combinations.
- Demand for color graphics capabilities will be rising very sharply over the next five years.
 - . This suggests that vendors will be responding to new and incremental demand for terminals aimed at the managerial, administrative, and office markets, where color graphics offers significant potential for productivity improvement.
 - . INPUT estimates that the IBM 3279 color display unit, introduced in late 1979, represents less than 2% of the installed IBM 3270 display terminal base. INPUT concludes that the need for color alone, in traditional applications, is insignificant.
- Competitive pricing is paramount among vendors' strategic considerations.
 - All vendors are looking to manufacturing efficiencies and higher production levels to reduce the costs of non-electronic components common to the four levels of asynchronous display terminals as defined for this study.
 - . Such components include cathode ray tubes, keyboards, power supplies, display housings, enclosures, cabling, and circuit boards (not the logic chips that are on the boards, but the physical boards and associated electrical connectors).
 - Smaller vendors are apprehensive of the risk that large competitors, through increased production volumes of non-electronic components, will achieve unit cost reductions that will enable them to set new pricing standards that the smaller vendors will be unable to meet.

- INPUT's research indicates that smaller vendors are ignoring Level 1 terminals entirely in their strategic plans, are largely avoiding Level 2, and are concentrating their development resources on Levels 3 and 4, in recognition of a competitive disadvantage vis-a-vis larger competitors that they perceive.
- Vendors recognize, however, that the opportunities for further reductions in non-electronic component costs are limited.
 - In addition, customers are increasingly demanding more features, functions, and flexibility.
- In general, vendors recognize that minimum-featured asynchronous display terminal products have become commodity merchandise, and seek to maximize profit margins and market share by differentiating their products through features that users and intermediaries request.
 - Even the vendors responsible for setting new, lower pricing standards for Level 1 and Level 2 terminals recognize that there is a limit beyond which cost-based price competition cannot be pushed, given current production technology.
 - These vendors include Lear Siegler Inc., Applied Digital Data Systems (ADDS), and Digital Equipment Corporation.
 - The likelihood that Japanese competitors will establish price dominance at the low end of the product scale is also a major factor in causing vendors to expand features and flexibility through microprocessor power.
 - Vendors view microprocessor basing as the key to reducing cost per function.

- In shifting product development emphasis to the Level 3 and Level 4 terminal subsectors, vendors look to the low-cost 16-bit microprocessor as the vehicle for adding features while holding costs to a reasonable level.
 - Since much of what users desire can be provided through microprocessors, vendors are increasing the amount of intelligence available at the terminal.
 - As stated above, intelligence and programmability will soon be mandatory features of display terminals.
- INPUT concludes that vendors are working toward increasing the proportion of Level 3 and Level 4 terminals in the shipment mix over the next five years.
 - Larger vendors, who historically have accounted for a major portion of Level 1 and Level 2 terminals, plan to provide device modularity attributes similar to Digital Equipment's VT-18X board option, through which a Level 2 VT-100 terminal can be converted into a personal computer by simply inserting a circuit board into the terminal.
 - Such vendors will continue to participate in the Level 1 and Level 2 subsectors, but their product and marketing strategies will be skewed toward Levels 3 and 4.
- INPUT's research indicates that component commonality across Levels 1 through 4 is a major strategic objective for large vendors.
 - The marketplace indicates that it will be increasingly receptive to standardization.
 - The very positive market response to Digital Equipment's VT-100 has generated a significant competitive reaction in that vendors view a wide (132-column) screen, such as that available on the VT-100, as a major market requirement over the next five years.

- Additionally, VT-100 emulation will become increasingly common.
- The demand for color graphics is expected to rise sharply over the next five years.
 - Vendor respondents reported this trend.
 - Although color can be demonstrated to have advantages over black and white alphanumeric screens, it is largely an emotional issue.
 - Vendors, however, see color as essential to being competitive and to having a competitive product line.
 - INPUT believes that the true value of color emerges in the field of color graphics in business applications.

B. SOURCES OF SUPPLY

- The larger vendors are integrating vertically with a view toward becoming totally self-sufficient in the production of components common to all levels of terminals, at volumes which will permit their Level I offerings (if any) to be priced competitively.
 - It appears that vendors who plan to continue participating in the Level I market are prepared to offset lower gross margins on Level I product revenues with higher gross margins at the higher function levels to maintain acceptable margins across the total terminal product program.

- ADDS, with its new facility in Utah that is capable of producing a million units per year, and Digital Equipment, currently producing (Level 2) VT-100s at the rate of 120,000 units annually at its Phoenix, Arizona, plant, appear to be the most fully integrated manufacturers of asynchronous display terminals.
- Smaller vendors are understandably reluctant to discuss their sources of supply in any great detail.
 - While quantitative data are not readily available, it is known that TeleVideo has major suppliers in Korea.
 - INPUT views TeleVideo's sourcing of components from Far East vendors as indicative of an industry trend.
 - For components with relatively high labor cost content, it is natural to deal with suppliers who are reputable and have relatively low labor costs.
 - Despite recent wage trends in the Far East, manufacturers located there retain a labor cost advantage over domestic and European competitors.
- INPUT believes that the Far East will remain a competitive source of asynchronous display terminal components.
 - In addition to cost, Far Eastern manufacturers enjoy a reputation for product quality.
 - Digital Equipment and Data General have relied for years on their Far Eastern subsidiaries for component and sub-assembly manufacturing.

C. INDUSTRY COVERAGE

- Lear Siegler dominates the independent portion of the noncaptive or independent asynchronous display terminal market, with shipments of 48,100 units in 1980, as shown in Exhibit IV-1.
 - This represents 12.5% of the total market, as measured by industry shipments of 385,000 units.
- Digital Equipment Corporation (DEC) is the industry leader in the total market, with 70,000 units, or 18.2% of the total.
- INPUT projects a shipment gain of 19.8% for Lear Siegler in 1981 and an increase of 28.6% for DEC in the same timeframe.
 - INPUT expects Lear Siegler and Digital Equipment to maintain their leadership positions over the intermediate term.
- Shipments of TeleVideo's 900 Series are likely to more than double in 1981 to 26,800 units from the 1980 shipment level of 12,800.
 - This reflects strong customer acceptance of the low priced Level 1 and 2 terminals offered by TeleVideo and discussed previously.
- INPUT forecasts a 23.4% increase in 1981 shipments to 475,000 units from 385,000 in 1980.
- Vendor estimates of shipments were compiled by asking respondents to list those whom they considered to be the top ten vendors and to estimate what each shipped.
 - Exhibit IV-2 presents the vendors' estimates of leading manufacturers' relative ranking in terms of market share.

EXHIBIT IV-1

ESTIMATED SHIPMENTS
OF ASYNCHRONOUS DISPLAY TERMINALS BY VENDOR,
1980-1981

(thousands of units)

VENDOR	1980		1981		YEAR TO YEAR CHANGE (percent)
	UNITS	PERCENT OF TOTAL	UNITS	PERCENT OF TOTAL	
Lear Siegler	48.1	18.5%	57.6	18.0%	+19.8%
ADDS	30.2	11.6	39.3	12.3	+30.1
Hazeltine	22.4	8.6	27.0	8.4	+20.5
TeleVideo	12.8	4.9	26.8	8.4	+109.4
Beehive	20.0	7.7	25.1	7.8	+25.5
Intelligent Terminals	15.0	5.8	21.2	6.6	+41.3
Visual Technology	12.7	4.9	17.5	5.5	+37.8
General Terminals	10.5	4.0	14.5	4.5	+38.1
Soroc	10.8	4.2	13.1	4.1	+21.3
Teletype	10.3	4.0	11.4	3.6	+10.7
Ann Arbor	8.0	3.1	10.2	3.2	+29.5
Others*	59.2	22.8	56.3	17.6	-4.9
TOTALS**	260.0	100.0%	320.0	100.0%	+23.1%

* INCLUDES 15.4 THOUSAND UNITS FROM PERKIN-ELMER IN 1980.
PERKIN-ELMER DROPPED OUT OF THE BUSINESS IN EARLY 1981.

** PRECISION OF TOTALS IS AFFECTED BY ROUNDING.

EXHIBIT IV-2

VENDOR ESTIMATES OF THE
LEADING MANUFACTURERS OF
ASYNCHRONOUS DISPLAY TERMINALS

MANUFACTURER	NUMBER OF MENTIONS IN RANKING						
	ONE TO FIVE	ONE	TWO	THREE	FOUR	FIVE	SIX OR SEVEN
Lear Siegler	7	4	1	0	2	0	0
ADDS	6	0	4	2	0	0	1
DEC	5	3	1	0	0	1	0
Hazeltine	5	0	1	3	1	0	0
TeleVideo	4	0	1	0	2	1	1
IBM	3	1	0	1	1	0	0
Data General	2	0	0	1	0	1	0

- Lear Siegler is considered by most to be the industry leader.
- ADDS is also consistently ranked as a leading manufacturer of asynchronous display terminals.
- INPUT used vendors' estimates, particularly each respondent's estimates of his own shipments, to validate INPUT's estimates and forecasts.
 - Respondents' estimates of leading competitors' market shares are provided in Exhibit IV-3.
 - Lear Siegler, ADDS, and DEC are considered by their peers to be the industry leaders.
 - Most vendor estimates of competitors' shipments were reasonably accurate, although a few overestimated by a considerable amount.
 - INPUT believes that respondents had a tendency to overestimate a particular competitor when that competitor's product was encountered most frequently in the respondent's particular marketplace.
- Vendors identified smaller competitors, not ranked in the top ten currently, who they believed are likely to become major factors in the market within the next few years.
 - Ann Arbor, Hazeltine, and IBM were considered to be major factors in the future.
 - TeleVideo, C. Itoh, and Volker-Craig were also mentioned, as seen in Exhibit IV-4.
- INPUT obtained vendor perspectives of IBM as a competitor, and these are reflected in Exhibit IV-5.

EXHIBIT IV -3

VENDOR ESTIMATES OF
LEADING MANUFACTURERS' MARKET SHARE,
1980 SHIPMENTS, AND OEM/END-USER RATIOS

MANUFACTURER	RESPONDENT	ESTIMATED 1980 SHIPMENTS (\$ thousands)	ESTIMATED MARKET SHARE (percent)	ESTIMATED OEM/END USER RATIOS (percent)	
				OEM	END USER
Lear Siegler	A	\$60	20%	50%	50%
	B	40	9	N/C	N/C
	C	100	25	N/C	N/C
	D	50	12	N/C	N/C
	E	50	14	60	40
ADDS	A	30	10	60	40
	B	32.5	7	N/C	N/C
	C	30-35	8	N/C	N/C
	D	100	25	N/C	N/C
	E	45	10	N/C	N/C
	F	45	10	75	25
DEC	A	70	26	60-70	30-40
	B	30	10	N/C	N/C
	C	152	43	75	25
Hazeltine	A	30-35	7	N/C	N/C
	B	30	10	65-75	25-35
	C	40	10	N/C	N/C
TeleVideo	A	30-40	10	N/C	N/C
IBM	A*	200+	50+	5-10	90-95
	B	10	3	N/C	N/C

N/C = NO COMMENT

* RESPONDENT'S ESTIMATE IS FOR ALL CRT'S SHIPPED

EXHIBIT IV-4

VENDOR PERCEPTIONS OF MANUFACTURERS
NOT RANKED IN TOP TEN

Ann Arbor

- Has 5% of Market

Hazeltine

- In Top 20
- 1980 Shipments of 25-30K
- 50-50 OEM/End User Sales Ratio

IBM

- Has 5% of Market
- In Top 20 Now, Will Be in Top 10 in Two Years

TeleVideo and C. Itoh

- Belong in Top 10

Volker-Craig

- Belongs in Top 25

EXHIBIT IV-5

VENDOR PERCEPTIONS OF IBM'S MARKET POSITION

- IBM Will Be in Top 10 Within Two to Three Years.
- IBM Has Had No Real Impact in the Past Two Years.
- IBM is a Very Strong Participant.
- IBM May Be Significant in the Future, But Not Today
- Independents Understand the Market Better. This is Not an IBM Market.
- IBM Does Not Know How to Sell Like a Mail Order House.
- IBM's Product is Too Expensive for the Features it Has.

- As the exhibit shows, respondents' opinions are wide-ranging.
- With respect to the negative perceptions, INPUT's opinion is that vendors are referring to the IBM 3101 in particular. As borne out by distributors' opinions, which are presented in Volume II of this report, competitive pricing is the major determinant in terminal selection in the Level I product sector.
- Vendors perceive the Level I market subsector as a commodity-type market, where market share is maintained or increased largely through high-volume production, mass distribution, and acceptance of low margins.
 - There is limited opportunity for product differentiation on the basis of factors other than price, as by definition a Level I terminal has no editing features.
 - Business purchasing agents concern themselves primarily with budgets and price after they have determined the reliability and reputation of a possible supplier.

V INDUSTRY OUTLOOK

V INDUSTRY OUTLOOK

A. PRODUCT TRENDS INCLUDING MAINTENANCE

- Exhibit V-I shows the number of respondents who identified specific asynchronous display terminal attributes in response to the following questions:
 - What are the trends for your products through 1986?
 - Historically, which of your options have been the best sellers, and which options have done the poorest in the marketplace?
 - With respect to options and features, what do you expect to happen during the next five years?
- Although all vendors did not have color, three believe that it will be a feature which will sell and, therefore, are planning to add color.
- As the questions did not specifically identify any attribute, INPUT believes that the frequent mention of certain attributes is significant.
 - Interpreting the responses within the context of other information provided by the respondents and other INPUT research, the direction of product development trends is toward Levels 3 and 4, with increasing use of 16-bit microprocessors to provide standard sets of commonly ordered features.

EXHIBIT V-1

VENDOR PERCEPTIONS OF PRODUCT FEATURE AND OPTION TRENDS (number of mentions)

ATTRIBUTE	RESPONDENTS' PRODUCT TRENDS THROUGH 1986	BEST SELLING OPTIONS	TRENDS IN OPTIONS AND FEATURES	PRODUCTS PLANNED	MAJOR MARKET TRENDS
Intelligence and/or Programmability	6	-	1	2	5
Color Graphics	3	-	-	-	1
Color	1	3	4	2	2
Graphics	-	2	-	-	1
Standardization of Features	4	-	5	-	-
Emulation	2	1	-	-	1

- Color, graphics, and color graphics were frequently mentioned in response to all the questions listed above.
 - . Only one of the respondents actually has color as an option in his product line; two vendors, stating that color is historically a best-selling option, were referring to the market in general, and plan to announce color as an option in 1982.
 - . It is clear that the availability of color as an option over the next five years is a prevalent concern.
- INPUT believes that the value of color is limited unless it is available in conjunction with high-resolution graphics.
 - "Busy" charts and the information they present are understood much more easily if they are in color, but they must be in chart form first - hence the perceived requirement for graphics capability.
 - This combination exacerbates the need for bandwidth on the monitor (currently available monochrome high-resolution displays require a bandwidth of from 30 to 50 megahertz), and reinforces the trend toward more intelligence, more memory, and more storage.
- Emulation capability most frequently referred to emulation of Digital Equipment's VT-100.
- An oblique reference to screen size by vendors was the favorable regard shown to the VT-100 terminal.
 - In addition, vendors' perceptions of the need to emulate this terminal means that they view the VT-100's 132-column width as a major product trend.

- Nondetachable or detachable keyboards do not seem to be a major issue with vendors.
 - Keyboard detachability is an issue for intermediaries, which reflect the latter's more direct contact with end users.
- Exhibit V-2 shows vendors' perspectives on the maintenance of their products.
- A majority of vendors maintain all or some of their installed product base.
 - Fully nine of eleven respondents maintain their products.
 - The two indicating third-party maintenance only stated that they have a contractual arrangement with the third-party maintainer, and that the arrangement is transparent to the user in that he deals with the manufacturer if service is unsatisfactory, and the manufacturer is responsible for applying the requisite pressure on the service organization.
- Vendors indicating that they provide on-site maintenance stated that the monthly maintenance charge is 0.1% of the purchase price of the terminal.
 - Only one respondent stated that the monthly charge for maintenance is 1% of the purchase price.
 - In view of the fact that maintenance is provided through a third party, this fee very likely includes the third party's mark-up.
 - As will be shown in Volume II of this report, this figure is consistent with the fees charged by intermediaries.
- Few vendors do not provide depot maintenance.

EXHIBIT V-2

VENDORS' PERSPECTIVES ON MAINTENANCE

VENDOR	WHO MAINTAINS	WHO SELLS CONTRACT	MONTHLY SERVICE CHARGE	
			ON-SITE	DEPOT
A	MFR	MFR	\$7.50	\$7.50*
B	MFR	MFR	N/A	13% Per Mail-In
C	MFR	MFR	N/C	N/C
D	MFR	REPS	N/C	N/C
E	3rd Party	MFR	1%	Below 1%
F	3rd Party	MFR	N/C	N/C
G	MFR or Distributor	MFR Distributor	N/C	1-1.5%
H	MFR or Representatives	Representatives	0.1%	N/A
I	MFR or Dealer	Representatives	0.1%	N/A
J	MFR or Representatives	Representatives	N/C	N/C
K	MFR, Distributor or 3rd Party	Any	0.1%	Fee Per Mail-In

* = \$7.50/MONTH INCLUDES BOTH

N/A = NOT AVAILABLE

N/C = NO COMMENT

- Where a monthly charge is assessed for depot maintenance, the charge ranges up to 1.5% of the purchase price.
- Two vendors stated that there is no monthly charge for depot maintenance, but that a fixed fee is imposed for every terminal that is mailed back to the manufacturer for repair.
 - . This suggests that these vendors perceive their products to be highly reliable, and the relative infrequency of product failure justifies the high fee for repair.
 - . Apparently their customers concur.
- In fact, vendors were unanimous in their perception that there is a growing trend toward carry-in or mail-in maintenance at the low end of the product range.
 - They stated that users are increasingly willing to do so.
 - Users reportedly carry a few spare units to ensure that work interruption at a station is kept to a minimum in the event of a terminal malfunction.
 - As the prices of keyboards move to the \$30-\$50 range, it becomes uneconomical to replace a malfunctioning keyboard.
 - . In essence, the keyboard becomes a throwaway item.

B. PRICING TRENDS

- Vendors were generally unwilling to comment on pricing trends, but INPUT's secondary research indicates that prices for Level I terminals remained within

a range of \$1,000 to \$2,500 until Lear Siegler introduced its ADM-3A model at a price of \$995.

- This caused Level 1 terminal prices to decline to a maximum of \$1,500 for other than ruggedized terminals.
- During 1976 and 1977, a shakeout in the Level 1 subsector directly attributable to the pricing of the ADM-3A caused about 30 of approximately 90 vendors to cease marketing their dumb terminals.
- By 1980, the marketplace had repriced bare-bones Level 1 units to the \$850 range.
- During the first quarter of 1981, ADDS introduced a microprocessor-based Level 1 terminal, the Viewpoint, priced at \$650 in single quantities and as low as \$450 in OEM quantities.
 - Equipped with a 1,920 character 12-inch screen, the device runs at 110 to 19.2K bits per second in switch-selectable half duplex or full duplex mode.
 - Estimated mean time between failures (MTBF) is in excess of 10,000 hours, or almost five years of a normal work schedule.
 - The low pricing is made possible by the LSI technology which permits the Viewpoint's entire logic electronics to be contained on a single circuit board with 11 chips, compared with earlier designs that required about 300 chips on four or five boards.
- Average prices for Level 2 terminals rose slowly from \$3,200 to \$3,700 in the 1972-1976 period.
- Hazeltine in 1976 introduced an editing terminal for \$2,050 and at least seven vendors countered with competitive products for under \$2,500.

- By 1980 the marketplace had repriced Level 2 products to around \$995.
- The introduction of a \$695 Level 2 terminal in May 1981 at the National Computer Conference by Hazeltine suggests to INPUT that a major repricing move is imminent in this sector of the industry.
- INPUT believes that pricing trends for Level 2 terminals will follow the trends seen in the Level 1 market sector.
- A similar shakeout in the Level 2 sector is likely, but the sector will probably remain profitable for efficient high-volume and innovative low-volume producers.
- Price levels for Level 3 and Level 4 terminals are much more diffuse, due to the range of options and features that they offer.
 - Depending on whether they compete with standalone personal computers that have occasional communications requirements, or with distributed processing products, prices should be clustering in the \$2,000-\$5,000 range and the \$6,000-\$12,000 range respectively.

C. COMPETITIVE TRENDS

- Exhibit V-3 shows who respondents perceived as not being a major competitor today but having the potential to acquire market share over the next several years.
 - This is consistent with INPUT's earlier observations on competition.
 - The responses very likely reflect each respondent's perception of competitive trends as they affect his own product line.

EXHIBIT V-3

VENDOR PERCEPTIONS OF
FASTEST GROWING COMPETITORS

VENDOR NAME	NUMBER OF MENTIONS
Hazeltine	3
TeleVideo	3
ADDS	2
DEC	2
IBM	2

- Japanese manufacturers are also a competitive factor.
 - In general, vendor responses indicate a healthy respect for Japanese capabilities, as well as for other Asian vendors (Koreans in particular), and for the French, as shown in Exhibit V-4.
 - The mention of Koreans likely reflects the vendors' increasing competitive encounters with TeleVideo, the founder of which is a Korean immigrant, and which imports components and sub-assemblies from Korea.
 - Mention of the French and of Telematique reflects an awareness of the French government's subsidy of an effort to make a national data base accessible to the public through display terminals, and of the potential for the related terminals to be marketed in the United States at very aggressive prices.
- INPUT believes the opinions that U.S. companies are too well entrenched with respect to technology and marketing, and that Japanese companies will have problems servicing their products in the U.S., are short-sighted.
 - Comparable arguments could have been advanced a decade ago with respect to the American automobile and television industries.

EXHIBIT V-4

VENDOR PERCEPTIONS OF JAPANESE COMPETITION
IN ASYNCHRONOUS DISPLAY TERMINAL MARKET

- Japanese will have very big market
- Japanese could be very strong, as they were with televisions.
- Asians, in general (especially Koreans), will impact U.S. market
- Potential future impact; no impact yet
- Getting bigger every day
- Their features are great
- American companies are too well entrenched
- "How will they service their products?"
- French (Telematique) will also be a factor

VI INDUSTRY FORECAST

VI INDUSTRY FORECAST

- INPUT's forecast of shipments of asynchronous display terminals through 1986 is presented in Exhibit VI-1.
 - Reliable data for captive (i.e., system vendor to end user) shipments for 1978 and 1979 could not be obtained.
- Major forecast assumptions are as follows:
 - Demand for asynchronous display terminals, especially for interactive applications, will continue to grow at a healthy rate.
 - Rising user demand for more features and more capability at the terminal site, in conjunction with diminishing price sensitivity as features and functions increase, will encourage vendor response aimed at increasing the installed base of Level 3 and Level 4 devices.
 - The implicit requirements of color graphics alone will spur the move to microprocessor basing, as well as the inclusion of more random access memory and on-line storage in Level 3 and Level 4 terminals.
 - Relative price insensitivity at the higher end will enhance vendors' motivations to upgrade their product mix, as the profit potential is much greater.

EXHIBIT VI-1

ESTIMATED SHIPMENTS OF ASYNCHRONOUS DISPLAY TERMINALS BY DISPLAY TYPE,

1978-1986

(units in thousands)

TERMINAL	1978	1979	1980	1981	1982	1983	1984	1985	1986	1981-1986 CGR [†] (%)
LEVEL 1										
Independents	65	80	92	99	98	100	85	60	40	-20%
Captive	*	*	55	45	30	7	-	-	-	n.m.
Replacements	-	-	5	15	32	40	65	95	120	+50%
Subtotal Level 1	*	*	152	159	160	147	150	155	160	flat
LEVEL 2										
Independents	65	85	107	131	162	190	230	275	325	+20%
Captive	*	*	45	75	105	118	120	110	90	+4%
Replacements	-	-	-	-	3	10	10	15	25	n.m.
Subtotal Level 2	*	*	152	206	270	318	360	400	440	+16%
LEVELS 3 - 4										
Independents	40	45	56	75	105	145	195	265	340	+35%
Captive	*	*	25	35	50	75	95	120	145	+33%
Replacements	-	-	-	-	-	-	-	-	5	n.m.
Subtotal Levels 3-4	*	*	81	110	155	220	290	385	490	+35%
TOTAL SHIPMENTS	*	*	385	475	585	685	800	940	1,090	+18%

* MEANINGFUL DATA NOT AVAILABLE

n.m. = NOT MEANINGFUL

† CGR = COMPOUND GROWTH RATE

- System vendors shipping display terminals to end users of the vendors' CPUs are unlikely to establish price leadership during the period.
 - . The only system vendor that INPUT sees as most likely to be the price leader, at the Level 2 product sector and above, is Digital Equipment.
- INPUT therefore predicts that Level 1 shipments will be flat during the 1981-1986 period.
 - The Level 1 display terminal market will be increasingly a replacement market during the period. Having been the first models to be installed, they will be the first to require replacement as they wear out.
- INPUT projects that Levels 2, 3, and 4 terminals will be increasingly preferred by end users as the need for distributed processing capability expands, particularly in the area of office automation and to support local area network expansion.
 - Price will diminish in importance as function increases.
 - System considerations will dictate function requirements to a greater extent, and will include the need for a display terminal to interface with more than one system (e.g., an IBM system, a DEC system, an Ethernet system, etc.).
- Exhibit VI-2 presents INPUT's projections of the year-end installed base of asynchronous display terminals by level and vendor category for the 1980-1986 period.

EXHIBIT VI-2

YEAR-END INSTALLED BASE OF ASYNCHRONOUS DISPLAY TERMINALS BY TYPE, 1980-1986

(units in thousands)

TERMINAL	1980	1981	1982	1983	1984	1985	1986	1981-1986 CGR* (percent)
LEVEL 1								
Independents	350	449	547	647	732	792	832	13%
Captive	227	272	302	309	309	309	309	3
Subtotal	577	721	849	956	1,041	1,101	1,141	10%
LEVEL 2								
Independents	299	430	592	782	1,012	1,287	1,612	30
Captive	346	421	526	644	764	874	964	18
Subtotal	645	851	1,118	1,426	1,776	2,161	2,576	25%
LEVELS 3 - 4								
Independents	266	341	446	591	786	1,051	1,391	32
Captive	92	127	177	252	347	467	612	37
Subtotal	358	468	623	843	1,133	1,518	2,003	33%
Independents Subtotal	915	1,220	1,585	2,020	2,530	3,130	3,835	26%
Captives Subtotal	665	820	1,005	1,205	1,420	1,650	1,885	18%
GRAND TOTAL INSTALLED	1,580	2,040	2,590	3,225	3,950	4,780	5,720	23%

* CGR = COMPOUND GROWTH RATE

APPENDIX A: ORGANIZATIONS INTERVIEWED
FOR THIS STUDY

APPENDIX A: ORGANIZATIONS INTERVIEWED FOR THIS STUDY

INPUT attempted to interview the president, vice president, national marketing vice president, terminal products marketing manager, or other senior executive of respondent organizations, on a best efforts basis. As the following lists show, INPUT's efforts were largely successful.

I VENDOR ORGANIZATIONS

	<u>NAME AND ADDRESS</u>	<u>PERSON INTERVIEWED</u>
1.	AITKIN-KYNETT (Marketing Agency for Zenith Systems) Philadelphia, PA	President
2.	ANN ARBOR TERMINALS Ann Arbor, MI	Marketing Manager
3.	BEEHIVE INTERNATIONAL Salt Lake City, UT	Director of Distribution
4.	DTI DATA TERMINALS Medfield, MA	Marketing Manager
5.	DATAVUE CORPORATION Grapevine, TX	National Sales Manager

	<u>NAME AND ADDRESS</u>	<u>PERSON INTERVIEWED</u>
6.	DIGITAL EQUIPMENT CORPORATION Marlboro, MA	Product Line Manager
7.	GENERAL TERMINALS, INC. Tustin, CA	Director, Product Marketing
8.	HONEYWELL INFORMATION SYSTEMS Waltham, MA	Director, Terminal Products Marketing
9.	INTELLIGENT SYSTEMS, INC. Norcross, GA	Marketing Manager, Communications
10.	INTERTEL DATA SYSTEMS Columbia, SC	National Sales Manager
11.	LEAR SIEGLER, INC. Anaheim, CA	Director, Product Marketing
12.	PERKIN-ELMER Flanders, NJ	Marketing Manager
 II SYSTEMS INTEGRATOR ORGANIZATIONS		
1.	A-O KOMPUTING Montgomeryville, PA	Marketing Director
2.	AW COMPUTER SYSTEMS Cherry Hill, NJ	Sales Manager
3.	ACCUREX CORPORATION Mountain View, CA	Manager, Applications Engineering

	<u>NAME AND ADDRESS</u>	<u>PERSON INTERVIEWED</u>
4.	ADVANCED COMPUTER TECHNIQUES New York, NY	Vice President
5.	ADVANCED INFORMATION SYSTEMS Hollywood, FL	Technical Director
6.	ASSOCIATED COMPUTER CONSULTANTS Santa Barbara, CA	Marketing Director
7.	AVCO ELECTRONICS DIVISION Huntsville, AL	Director, Systems Marketing
8.	BASIC TIME, INC. Carson, CA	Product Marketing Manager
9.	BRISTOL INFORMATION SYSTEMS Fall River, MA	Sales Manager
10.	BUCK ENGINEERING CO., INC. Farmingdale, NJ	Director of Education
11.	COM BUSINESS COMPUTER SYSTEMS Fayetteville, NY	Vice President, Marketing
12.	COLE-LAYER-TRUMBLE CO. Dayton, OH	Vice President, Marketing, Systems
13.	COMM BASIC ASSOCIATES Dayton, OH	Programmer
14.	DATATAB New York, NY	Vice President

	<u>NAME AND ADDRESS</u>	<u>PERSON INTERVIEWED</u>
15.	DAVID JAMISON CARLYLE Matawan, NJ	Vice President, Marketing
16.	DECISION MICROSYSTEMS, INC. New York, NY	Sales Support Manager
17.	TMI SYSTEMS, INC. New York, NY	Vice President
18.	TECHNICAL ANALYSIS CORPORATION Atlanta, GA	Director, Product Marketing
19.	TRANSCOMM DATA SYSTEMS, INC. Pittsburgh, PA	Vice President
20.	WISMER & BECKER Sacramento, CA	Marketing Manager

III DISTRIBUTOR ORGANIZATIONS

1.	BFA, INC. Las Cruces, NM	President
2.	BARTLETT ASSOCIATES White Plains, NY	Sales Engineer
3.	BRONSON & BRATTAN Chicago, IL	Vice President, Sales
4.	COMMAND, INC. Indianapolis, IN	Marketing Manager

	<u>NAME AND ADDRESS</u>	<u>PERSON INTERVIEWED</u>
5.	DANER-HAYES, INC. Waltham, MA	Marketing Manager
6.	DAVID JAMISON CARLYLE Los Angeles, CA	Executive Vice President
7.	GERHARD & ASSOCIATES Columbus, OH	President
8.	RANNIGER CO. Arvada, CO	President
9.	SELECTERM Wakefield, MA	President
10.	TRANSNET CORPORATION Union, NJ	Vice President, Sales
11.	WESTWOOD ASSOCIATES, INC. Springfield, NJ	1) Vice President, Engineering 2) President

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